THE METAL INDUSTRY

With which is Incorporated The Aluminum World,
The Brass Founder and Finisher and Electro Platers Review.

A TRADE JOURNAL RELATING TO THE NON-FERROUS METALS AND ALLOYS.

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BRONZE

OLD SERIES Vol. X. No. 5.
Vol. II No. 5. NEW SERIES

LABOR OMNIA VINCIT

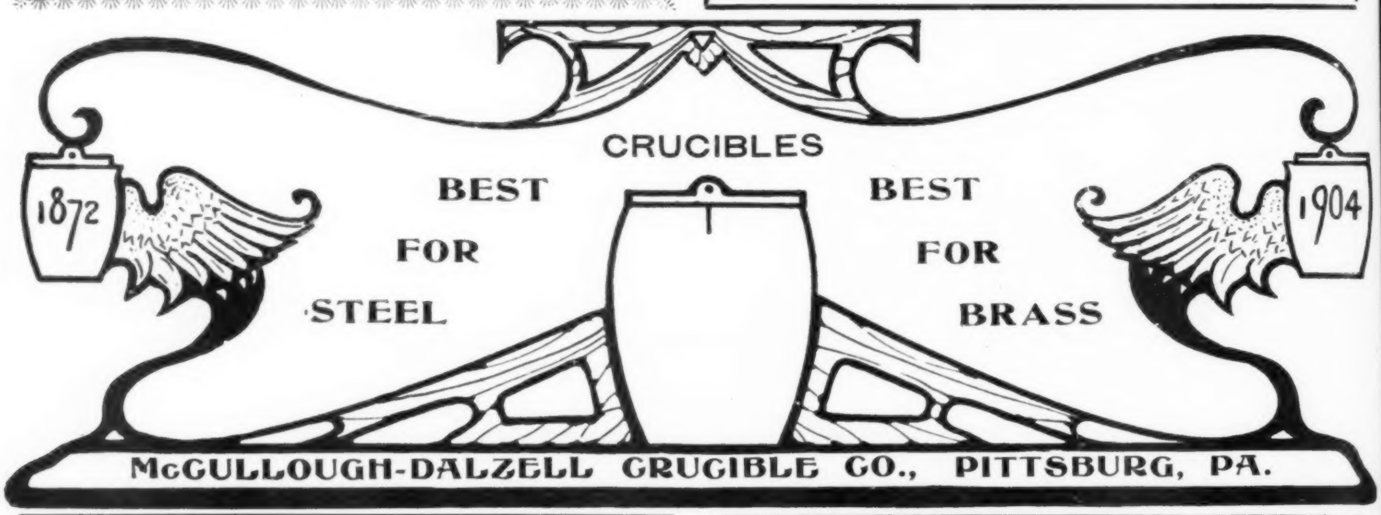
MAY, 1904

NEW YORK.

61 BEEKMAN ST.

$1.00 PER YEAR · 10 CTS PER COPY

Entered February 10, 1903, at New York, N. Y., as second-class matter under act of Congress, March 3, 1879.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THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED THE ALUMINUM WORLD, THE BRASS FOUNDER AND FINISHER, AND ELECTRO-PLATERS REVIEW.

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OLD SERIES VOL. X., NO. 5. | NEW YORK, MAY, 1904 | NEW SERIES VOL. II., NO. 5

THE METAL INDUSTRY AND The ALUMINUM WORLD AND The BRASS FOUNDER AND FINISHER AND ELECTRO PLATERS REVIEW

PUBLISHED MONTHLY BY

The Metal Industry Publishing Company

(Incorporated)

61 BEEKMAN STREET, NEW YORK

PALMER H. LANGDON, ... *Publisher*
ERWIN S. SPERRY, ... *Editor*
JOHN B. WOODWARD, ... *Director*

Subscription Price $1.00 per year, postpaid to any part of the world. Single copies, 10 cents.

ADVERTISING RATES ON APPLICATION.

Entered February 10, 1903, at New York, N. Y., as Second Class Matter Under Act of Congress March 3, 1879.

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BRASS INGOT.

For a long time past brass foundrymen have had an aversion to the purchase of ingot metal already mixed. That such an aversion has been well founded is undoubtedly correct, but it has occurred through the indiscriminate use of brass ingot purchased from irresponsible parties and not from the belief that brass ingot itself has any bad qualities. The foundryman has condemned the practice without giving the case a fair trial.

Contrary to the usual idea, alloys which have been melted make better castings than those which are first used without pouring into ingots. This is particularly so with copper alloys containing tin or aluminum and one of the largest producers of copper alloys in this country, noted for the excellence of its products, invariably melts tin bronze twice when particularly high grade work is required. Aluminum bronze likewise is a poor material until it has been melted twice. Of course, the requirements of the majority of metal products are such that the price will not admit of two meltings nor is it necessary, but we cite these instances merely to indicate that the fear of the uncertainty of brass ingot is entirely unfounded. It has been the common practice among brass founders to lay all troubles to the use of scrap. Blowholes, abnormal shrinkage, cracks, dross, and sponginess are all presumed to be caused by scrap, and when they occur something must be blamed for the difficulty, and it is usually the fact that scrap has been used. Further than this there is no evidence to support the belief.

There are two things in the use of scrap, however, that we must not overlook, and that is the uncertainty of the mixture in a miscellaneous assortment of scrap and the loss in melting. These obstacles may be entirely overcome in the purchase of brass ingot, and, indeed, another difficulty not to be lightly passed, that of the unsoundness in the casting resulting from the melting of finely divided material. Chips, filings, or turnings never make as sound castings as ingot of the same composition, as there is so much more surface exposed to the action of the air and gases of the fire during the melting. In fact, it may be said that the larger the mass of metal which is melted, the sounder the resulting casting. We believe that this statement will apply to any metal or alloy, and, indeed, may be justly called one of the axioms of the metal industry.

We can conscientiously say that the brass foundryman would do well to again take up the subject of the purchase of brass ingot, for he certainly can save money by following this practice. He must use as much judgment, however, in purchasing this material as would be exercised in the purchase of copper, and buy only from those who make a good brass ingot and who have facilities for controlling the mixture. If this is done and a really good brass ingot is purchased, we firmly believe that he will continue to use it. It will not only relieve him of the trouble of making the mixtures, but reward him with a profit as well.

CATHODE COPPER.

The advent of the electrolytic method of refining copper was responsible for the placing of a new commodity on the metal market, cathode copper. Resulting as it does from the electroplating of copper from an copper anode it would seem quite natural that such cathode copper should be very pure. In the early days of the electrolytic copper industry the cathodes were used in the condition in which they were produced (*i. e.,* without expense of melting such pure material and, indeed, actually injuring it.

Cathodes continued to be used for a time, but it was soon found that no dependence could be placed upon their uniformity. One cathode would give good results while the next night have so much impurity in it that the copper alloys made from it were of no value. The practice of melting the copper in a reverberatory furnace and refining it like any copper next followed, as by this method a thorough mixture of the good and the bad took place and uniformity followed in the product. This practice still follows, but for some time past there has been a tendency to return to the use of cathode copper, presumably on account of a slight concession in price, but quite recently another reaction has set in and the tendency is again in favor of the ingot copper or that which has been melted.

We advocate the use of ingot copper in preference to cathode copper for several reasons. The electrolytic process of refining copper is an exceedingly delicate one and unless constant vigilance is maintained in the strength of current, in the condition of the solution, in the acidity of the solution, and in many other minute details the quality of the cathode will suffer. One cathode which the customer receives may be perfectly pure while the next one may be loaded with impurities. We have, indeed, tested cathode copper which had an electrical conductivity of 104 per cent. and, therefore, chemically pure and at the same time found others from the same maker which only had 90 per cent. Some one had erred or attention had not been paid to some little detail in the manufacture. Again, there is no method of testing the purity of a lot of cathode copper except by testing each individual sheet. This lack of uniformity in cathode copper has given much trouble in the manufacture of copper alloys and the practice of melting and refining it according to the well known methods of copper refining is to be highly commended. The whole batch may then be tested for electrical conductivity, the most rapid and certain test for the purity of metals, and the exact quality of the whole amount of fifteen or twenty tons may be positively known. The consumer may likewise test the copper to a much better advantage by cutting off the "heel" of various ingots, forging them down to a bar which may be readily drawn into wire and tested for conductivity. It would, at first, seem almost superfluous to melt copper which is already pure, but the only object is one of standardization and not of purification.

EMERY WHEELS.

For the production of finished surfaces on brass work grinding is replacing, to a large extent, that of machining, and undoubtedly would do so to an even greater degree were the function and use of the emery wheel better understood by the brass manufacturer. The emery wheel is a tool that is subject to abuse and misuse, and we believe that it will react as favorably for the consumer as well as the emery wheel manufacturer to make a few remarks regarding the proper function of this useful appliance so that the former may not misjudge the quality of the wheel which he may be using and enable him to obtain the greatest return for his expenditure.

All classes of metals are now ground on the emery wheel. The hardest tempered steel and the softest brass with the intermediate variations. The greatest error made by the consumer is to believe that a wheel which is suitable for one class of work may be advantageously employed on another. We have distinct recollections of the manner in which we "turned down," at a former time, the product of a leading emery wheel manufacturer because it would not grind brass in a manner which was at all satisfactory. Much to our embarrassment we found later that the wheel was not intended for use on soft brass work, but was made for the purpose of grinding the hardest steel. We had obtained it from the middleman whose only object was to sell emery wheels and believed as we did at that time that an emery wheel never differed in quality except when made by different makers. We are free to say that we have since realized the folly of our belief and are now willing to place ourselves at the mercy of the maker and allow him to furnish us with a wheel which will do the work required.

There are distinct technical reasons why an emery wheel should not be made uniform in quality. One metal requires decidedly different treatment than another, much the same as a certain shaped tool cannot be used for turning all kinds of work on a lathe. We do not mean that all wheels will not grind, for they certainly come within this requirement, but if the brass manufacturer or founder will obtain a wheel from an honest manufacturer which is made purposely for the metal that he intends to grind he will surely notice a marked difference in his work. A hard wheel on brass rarely gives good results, and the user is too apt to judge the quality of wheel by its life, and not from the quantity of work which has been ground. A wheel to work well on soft metals must be somewhat soft itself and will, therefore, wear away more or less rapidly. Do not condemn a wheel because it wears out. You will find that the quantity of work will increase in proportion.

We believe that the emery wheel consumer cannot do better than to place himself at the mercy of the manufacturer, and above all let him know exactly what material is about to be ground. The proper grade of wheel for the work will then be sent and much of the dissatisfaction often experienced will not be manifested. If a soft wheel is sent do not believe that it was sent for the distinct purpose of wearing out.

A STUDY OF THE STAGES IN THE REFINING OF COPPER.*

BY H. O. HOFMAN, C. F. GREEN, AND R. B. YERXA.

In refining copper, the metal is melted down in a reverberatory furnace in a more or less oxidizing atmosphere and then further subjected to an oxidizing smelting in order to eliminate the common impurities, most of which have a stronger affinity for oxygen than has copper. In these operations some of the copper is oxidized to cuprous oxide and dissolved by the metal bath. When the quantity of dissolved cuprous oxide has reached about 6 per cent., the metal is said to have been brought to "set-copper." A button-sample will show a depressed surface and, when broken, a single bubble at the apex of the depression; the fracture will be brick-red and dull. It is essential to carry the oxidation to this point in order to know that the impurities have been oxidized as far as it is possible under the given working conditions. Nearly all the cuprous oxide of the set-copper is now reduced to the metallic state by poling, when "tough-pitch" copper will be obtained. A button-sample will show a flat surface. Upon breaking, it will be found that the former bubble has disappeared and that the fracture has become rose-colored and shows a silky luster. The quantity of cuprous oxide allowed to remain in the copper will vary with the impurities still present in the metal and with the degree of pitch that it is desired to reach. It is essential for the general physical and the mechanical properties of the resulting copper that such impurities as arsenic, antimony, bismuth, lead shall be present in the oxidized state, as they are then less harmful than when present in the metallic state. Refiners commonly distinguish "ingot- or cake-pitch" and "wire-bar pitch"; copper brought to the former contains more cuprous oxide than the latter. These two pitches are, however, not absolutely fixed; they vary with the practice of the individual refiner and with thickness of the cake or bar that is to be cast:—The thicker the piece, the more oxygen will have to remain in the metal, if a flat surface is to be obtained. A third degree of pitch aimed at is that required by very thin castings, such as electrodes 0.5 inch in thickness. As this pitch lies beyond that of wire-bar copper and differs from it more than to permit its being designated merely a shading, it may be called "plate-pitch."

DESCRIPTION OF SAMPLES.

Button-samples for this investigation were kindly furnished by Mr. W. T. Burns, of the Boston & Montana Consolidated Copper and Silver Mining Co., Great Falls, Mont.; by Mr. M. B. Patch, of the Buffalo Smelting Works, of the Calumet & Hecla Mining Co., Buffalo, N. Y.; and by Mr. G. M. Luther, of the Nichols Chemical Co., Laurel Hill, N. Y.

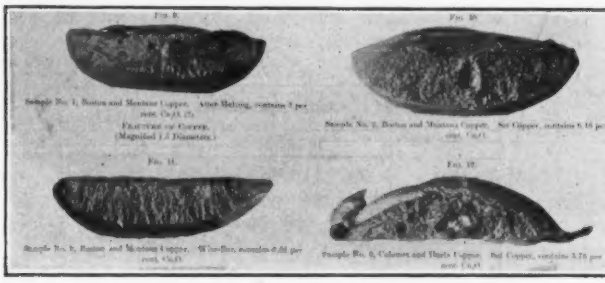
Sample No. 1 of the Boston & Montana Co. represents cathode copper after it has been melted down in the reverberatory furnace and skimmed, but not rabbled; No. 2 was taken after the rabbling had been completed and the stage of set-copper reached; No. 3 is the sample after the poling has been finished, and the copper is ready to be ladled into wire-bars. The tests made at the works give: silver, 0.8 oz. per ton; arsenic and antimony, 0.0035 per cent.; conductivity, 97.5 per cent.; tensile strength, 64,200 lbs. per sq. inch; elongation, 1 per cent.; torsion-twists in 6 inches, 89.

Sample No. 0 of the Buffalo Smelting Works represents set-copper; the remaining six of the set, Nos. 1, 2, 3, 4, 5 and 6, were taken at intervals of 15 minutes during the poling-period: No. 1 was cast after the poles had been in the furnace for 15 minutes; No. 6 is finished refined copper brought to a pitch at which ingots or cakes are cast. Samples Nos. A and B, from another charge, represent copper brought to ingot-pitch and wire-bar pitch respectively, special care having been taken to allow the samples to cool slowly.

The sample of the Nichols Chemical Co. represents plate-pitch, *i. e.,* the pitch desired for casting thin electrodes.

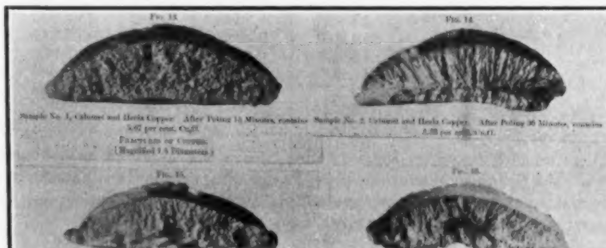
FRACTURES OF SAMPLES.

The fractures reproduced in Figs. 9 to 18, inclusive, were prepared in the usual way. An incision about 0.125



inch in depth was made across the convex side of a button with a cold-chisel, the button then clamped in a vise with the incision just protruding above the jaws, and given one or more shearing blows with a heavy short-handle hammer. With set-copper, one blow was sufficient to break the specimen in two; the nearer the sample approached tough-pitch copper, the larger was the number of blows required to obtain a fracture.

Figs. 9, 10 and 11 give the fractures of the Boston & Montana samples Nos. 1, 2 and 3 in one and one-half times their natural sizes. Fig. 9, cathode copper after melting and skimming, but before rabbling, has a fracture radiated and columnar, luster is absent, the color a dark red. Fig. 10 is set-copper, the fracture has lost its radial character and has become coarse-columnar to coarse-cubical, it remains dull, the color has changed to a brick-red; in the apex of the depressed surface there has ap-



peared the characteristic single bubble. Finally, Fig. 11 represents refined copper brought to wire-bar pitch; the fracture is finely-granular and fibrous, the luster is very silky, and the color roseate.

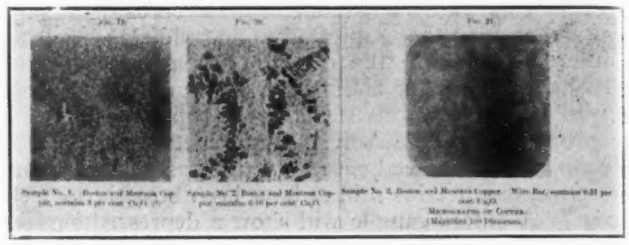
Samples Nos. 0 to 6 of the Calumet & Hecla Co., shown in Figs. 12 and 18, begin with set-copper and end with ingot-copper. The fractures, starting from coarse-columnar and cubical (Fig. 12), lose their columnar character, remaining coarse and cubical (Fig. 13), they become coarsely radiated (Fig. 14), then the radiation assumes finer forms and granulation puts in an appearance (Fig. 15), granulation predominates over radiation (Fig. 16), both become finer (Fig. 17), until with Fig. 18 radiation has been entirely replaced by granulation. In a similar manner the luster, from being absent with

*Abstract of paper presented American Inst. Mining Engineers, October, 1903.

Fig. 12, becomes at first slightly silky; then silkiness increases until full silkiness is reached with Fig. 18. The dark brick-red color of Fig. 12 becomes lighter (Figs. 13, 14 and 15), rose-color begins to be seen (Figs. 15 and 16) until full rose-color is reached with Fig. 18.

The observations on the fractures are brought together in Table II.

cuprous oxide over the eutectic; it shows fern-like forms which spring up in relief against the eutectic background. The fern-like forms are very unevenly distributed; the



eutectic field in some places was free from them, in others it was entirely covered with them. Sample No. 3 (Fig.

TABLE II.—*Observations on Fractures of Sample-Buttons.*

Properties.	Boston and Montana. Samples			Calumet and Hecla. Samples						
	No. 1.	No. 2.	No. 3.	No. 0	No. 1.	No. 2.	No. 3.	No. 4	No. 5.	No. 6
Texture	Radiated, columnar.	Col mnar, cubical, coarse.	Finely-granular, fibrous.	Cubical, columnar, quite coarse.	Cubical, coarse.	Radiated, coarse.	Finely radiated, somewhat granular.	Granular to finely-radiated.	Finely-granular, with some fine radiation.	Finely-granular
Luster	Dull.	Dull	Very silky.	Dull	Dull, with specks of silkiness.	Dull, with increasing silkiness.			Half dull, half silky	Nearly full silkiness.
Color	Dark brick.	Brick.	Rose.	Brick	Brick	Light brick.	Light brick.	Light brick to rose.	Light brick to rose.	Rose.

TABLE III.—*Determinations of Oxygen in Samples of Copper.*

Sample.		Weight of Copper Used.	Weight of Oxygen Found.	Quantity of Oxygen in Copper	Quantity of Cuprous Oxide in Copper.
		Grams.	Grams.	Per Cent.	Per Cent.
Boston & Montana..	No. 1	9.9251	0.0319	0.322*	2.88*
		10.2990	0.0347	0.337*	3.015*
	No. 2	10.1953	0.0702	0.688	6.159
		13.2269	0.0873	0.659	5.905
	No. 3	6.7495	0.0054	0.056	0.503
		6.7671	0.0048	0.058	0.523
Calumet & Hecla...	No. 0	10.5543	0.0679	0.643	5.757
		11.5738	0.0744	0.643	5.755
	No. 1	12.6041	0.0791	0.628	5.618
		10.9386	0.0700	0.640	5.725
	No. 2	11.9961	0.0430	0.358	3.207
		12.1626	0.0456	0.375	3.360
	No. 3	11.8279	0.0242	0.205	1.830
		16.2051	0.3440	0.212	1.900
	No. 4	12.6454	0.2940	0.221	1.980
		13.8294	0.3080	0.223	1.990
	No. 5	13.3018	0.1250	0.094	0.841
		18.2256	0.1690	0.093	0.839
	No. 6	11.3544	0.0059	0.052	0.465
		12.2972	0.0072	0.058	0.524
		13.1625	0.0068	0.052	0.463

* These samples contained some sulphur, which was given off as hydrogen sulphide; the figures represent, therefore, oxygen plus sulphur, and not sulphur alone—and the figures in the last column ought to be too high, but, as seen by micrograph, Fig. 19, they are very much too low.

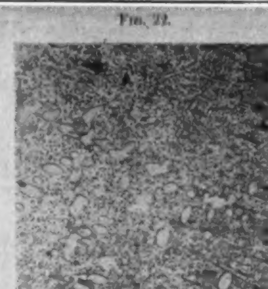
The results obtained are given in Table III. It will be noticed that the average percentage of cuprous oxide of the Boston & Montana wire-bar copper is higher than that of the Calumet & Hecla cake-copper, although the former had been brought to a higher pitch and should, therefore, contain less oxygen. The discrepancy may be explained by the fact that the Boston & Montana copper contains more impurities than the Calumet & Hecla; and these impurities are present as oxides.

The Boston & Montana sample No. 1 (Fig. 19), taken after melting and skimming the cathodes, is seen to contain a slight excess of cuprous oxide over the eutectic, although the analysis gives only 3 per cent. cuprous oxide. The black crystals are small, but easily distinguished from the cuprous oxide of the eutectic. Sample No. 2 (Fig. 20), set-copper, contains a large excess of

21), wire-bar copper, shows an evenly distributed fine net-work of eutectic enclosing large meshes of copper.

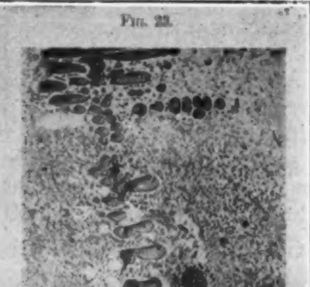
In the Calumet & Hecla series, sample No. 0 (Fig 22), set-copper, shows patches of excess-cuprous oxide in the eutectic. Sample No. 1 (Fig. 23), taken 15 minutes after

FIG. 22.



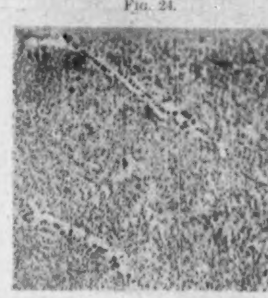
Sample No. 0, Calumet and Hecla Set Copper, contains 5.76 per cent. Cu_2O.

FIG. 23.



Sample No. 1, Calumet and Hecla Copper. After Poling 15 Minutes, contains 5.67 per cent. Cu_2O.

FIG. 24.



Sample No. 2, Calumet and Hecla Copper. After Poling 30 Minutes, contains 3.36 per cent. Cu_2O.

FIG. 25.

Sample No. 3, Calumet and Hecla Copper. After Poling 45 Minutes, contains 1.86 per cent. Cu_2O.

poling had begun, does not differ much from sample No. 0, proving that the reduction had not proceeded very far. On the whole, both samples resemble very much the set-copper sample (No. 2) of the Boston & Montana, although they do not show the fern-like forms so clearly developed. The eutectic, in most cases, is slightly sepa-

rated from the patches of excess-cuprous oxide crystals by a narrow band of copper, and the cuprous oxide in the eutectic seems to have separated somewhat from its cop-

Fig. 26.

Sample No. 4, Calumet and Hecla Copper. After Poling 60 Minutes, contains 1.98 per cent. Cu_2O.

Fig. 27.

Sample No. 5, Calumet and Hecla Copper. After Poling 75 Minutes, contains 0.84 per cent. Cu_2O.

Micrographs of Copper.
(Magnified 100 Diameters.)

Fig. 28.

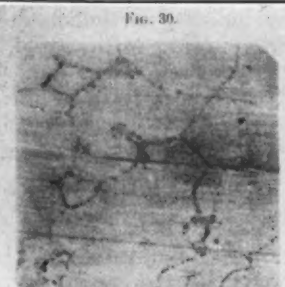
Sample No. 6, Calumet and Hecla Copper. After Poling 90 Minutes, contains 0.47 per cent. Cu_2O.
(Ingot Copper Cooled Quickly.)

Fig. 29.

Sample "A," Calumet and Hecla Ingot Copper Cooled Quickly, contains 0.01 per cent. Cu_2O.

per, thus giving the field a spherulitic appearance. In sample No. 2 (Fig. 24), the third taken, reduction has progressed rapidly, but it still contains a slight excess of cuprous oxide over that of the eutectic mixture. It resembles sample No. 1 of the Boston & Montana series. In sample No. 3 (Fig. 25), the eutectic has been passed, and the excess-copper becomes apparent. Sample No. 4 (Fig. 26) shows that little progress was made in the reduction in the 15 minutes that elapsed between the taking of samples No. 3 and No. 4. An explanation for this is that during this period, 45 minutes after poling had begun, the poles were withdrawn and new ones put in their

Fig. 30.



Sample "B," Calumet and Hecla Wire-Bar Copper Cooled Slowly, contains 0.275 per cent. Cu_2O.

Fig. 31.

Sample of Nichols & Co.'s Plate-Copper.

Micrographs of Copper.
(Magnified 100 Diameters.)

places. In sample No. 5 (Fig. 27), the cuprous oxide is very much diminished, the eutectic forms a thin net-work enclosing copper in its meshes. Finally, sample No. 6 (Fig. 28), represents refined copper brought to ingot-pitch. The net-work of the eutectic is imperfect and broken, and the dark parts of the eutectic are bunched together and larger than expected.

Finally, micrograph Fig. 31 represents a sample of copper from the Nichols Chemical Co. which has been brought to plate-pitch, *i. e.,* the poling has been carried further than is the case with the highest degree of wire-bar pitch of the Calumet & Hecla Co.

The features relating to fractures have already been summarized. Comparing the cuprous-oxide content obtained by chemical analysis and by planimetric measurement, it will be seen that the percentage of cuprous oxide found by analysis in the Boston & Montana sample No. 3, and in the Calumet & Hecla samples Nos. 3 and 4, is somewhat higher than that by measurement. This may be due to the fact that the chemical analysis gives the total oxygen, that of the copper as well as that of the impurities, while measurement gives only the oxygen of the copper. That the oxygen found by analysis in the Calumet & Hecla samples Nos. 5 and 6 is lower than that obtained by measurement is probably due to the segregation of the cuprous oxide in the eutectic, causing the latter to spread somewhat. Taking the results as a whole, they show that area-measurements of enlarged micrographs of pure coppers containing less oxygen than the eutectic give good valuations of the oxygen-content. Further, it seems entirely feasible to make quickly a close estimation of the percentage of cuprous oxide contained in a sample of copper by simply examining a polished surface with the microscope, when once some experience has been gained. The mode of operating might be as follows: To take a button-sample, cool it slowly and quench it when it had solidified, cut out a piece with a circular saw, grind it smooth on a number of revolving wooden disks covered with emery-cloth or on revolving files, polish with rouge and water on a revolving disk covered with broadcloth (a mirror-like surface would not be necessary), and estimate with the microscope the percentage of cuprous oxide present. The whole operation could be done in from 6 to 8 minutes. The poling could then be controlled by the microscope, and the degree of pitch desired for ingot-, large or small cake-, wire-bar- or electrode-copper defined by a readily ascertainable amount of cuprous oxide that should be present.

LEAD ROOFS.

For many classes of roof, lead is suitable, and in England and on the Continent it has been used for a long time. Some beautiful examples of architectural designs in lead now exist in England, but in our own country the use of lead does not seem to have made much headway. A recent writer makes the following comments on the subject. He says that in a steep pitch roof and which shows conspicuously against the sky, lead is hardly suitable unless the building is lofty and monumental. When the roof is flattish and not conspicuous, lead is undoubtedly the best material for the purpose. It is particularly suited for roofs of a highly decorated nature. Special devices are used to keep the lead from creeping. In order that the lead should resist the action of the atmosphere as much as possible, it is best to make the sheet from scrap, which gives a metal better suited for this purpose. Pure lead soon becomes covered with a white coating, but lead which contains a small amount of tin or antimony does not corrode as readily. Scrap lead is sure to contain considerable of these metals and so gives a better material than the pure metal.

TREATING GOLD AND SILVER SWEEPS.

One who visits an establishment which works gold and silver is usually surprised at the apparent indifference with which the material is allowed to become scattered around the place. It is believed that material which becomes scattered around the floor is sure to be lost. This is not the case, as every establishment of such a kind carefully saves everything which is scattered about. The floor is carefuly swept, the rags, buff wheels, and even the clothes of the workmen are burned and the result sold. When the loss is figured in such an establishment, it is usually found to be very small.

With all the care that is taken by some concerns in saving everything of this kind, it is surprising to find many others who are entirely ignorant of the manner in which such material should be treated. They allow a pile of material to accumulate, sweepings from the floor, old buff wheels, rags and waste, old shoes and hats, overalls, grease, cyanide slimes, etc., and then are bold enough to ask the various sweep smelters to bid on such a mess. As the smelter cannot afford to take any chances on such a mongrel lot of stuff, he usually makes an offer which is so low

Sweep Reducing Furnace.

that he cannot loose, and the owner of the lot is invariably the loser. How can the smelter be expected to know what is in the lot? He cannot possibly obtain a sample which will represent with any fairness at all the amount of gold and silver in the mess.

Well regulated establishments working gold and silver make the rule that nothing shall be taken away from the shop in the form of refuse. Everything is allowed to accumulate, the sweepings from the floor, rags, waste, the workmen's clothes, shoes and overalls, in fact everything which contains silver or gold. If the practice of removing part of the material as not being valuable was followed, some precious metals would surely sooner or later become lost. When a sufficient amount of such material has accumulated, it is burned in a sweeps furnace, ground in a mill and sifted. The metallic material will remain behind and can be melted in a crucible to bullion, while the fine substance which goes through the riddle can be thoroughly mixed and a sample obtained which will be so satisfactory that the smelter will be glad to make a close bid, as he then takes no chances.

There are few establishments in which it would not pay to do this. All that is required is a furnace for burning the sweeps. An ordinary stove is excellent, and a sweeps furnace is nothing more. In the accompanying sketch a gas sweeps furnace* is illustrated, and is an excellent piece of apparatus for small establishments. It is believed that those who have not installed a sweep furnace will certainly find such an appliance a paying investment and that they will be able to more than pay for the installation by the increase in price which they will be able to obtain for their sweeps.

*Made by American Gas Furnace Co.

THE LARGEST CASTING EVER PRODUCED.

The fame of the great bell of Moscow, Russia, has spread far and wide, but it is not generally known that it is the largest casting of any description ever made, either in iron or bronze. How such a gigantic mass of metal was cast will probably never be known, but the fact remains that it was done, and the casting stands as a monument to its makers whoever they were.

The veneration which the Russian people have for the bell makes it extremely difficult to obtain any information about it, otherwise than simple tradition, and practically the only real information of any value was obtained by two English travellers in the early part of the nineteenth century. It is probable that more vigilance is exercised at the present time than at that period, although these travelers state that several attempts to file off a small portion of the bell resulted in their being frustrated in the attempt. They did this in order to obtain sufficient material for an analysis as, even at the present time, the composition of the bell is unknown. It is stated that the nobles threw in gold and silver at the time it was cast as offerings. The bell has a much whiter color than is usual in bell metal, which would seem to indicate that either such was the case, or that much more tin was added than is customary.

The bell now lies in the pit where cast, and never was hung. One of the travellers says that one might attempt to hang a battleship as to hang the bell. A piece is broken from the side, as the building in which it was cast took fire while the bell was cooling in the mold, and the water poured on the fire cracked the piece out. The measurements which the two travellers took resulted as follows, viz.: Circumference, 67 feet 5 1-3 inches; height, 21 feet 4½ inches; thickness, 23 inches. The weight from calculation is 443,772 lbs.

THE WOHLWILL GOLD REFINING PROCESS.

This process for refining gold electrolytically is now being used at the Mint in Philadelphia and produces gold of a purity never before obtained. The process is a very simple one to work and produces the gold in a sponge which may be readily treated in the crucible or used for other purposes. It is generally supposed that the United States Government has the exclusive right to use this process, but we understand that they are only licensees and that any one may use the process on payment of royalty to the Wohlwill Company.

RESEARCHES ON ALLOYS OF MANGANESE AND COPPER.

The addition of phosphorus to molten copper for the purpose of removing the inevitable cuprous oxide has the disadvantage that, if a slight excess is used (and it is practically impossible to determine the exact quantity needed in each case), the alloy shows a loss of elongation and may become brittle. For this reason, in the manufacture of bronze for castings, the use as a deoxidizing agent of an alloy of manganese and copper, containing about 30 per cent. of the former, is increasing as an excess has no injurious effect. In the production of bronzes for rolling or drawing, manganese plays a still more important part, as in this case the use of phosphorus is out of the question. The numerous metals, sold under fancy names, containing approximately 40 per cent. zinc and 60 per cent. copper, are all made by the use of manganese as a deoxidizer, and contain 2 per cent. and upward of that metal.

A copper-manganese alloy, containing about 5 per cent. of manganese, is becoming more and more generally used in Europe for locomotive stay bolts in place of pure copper. Up to 400 degrees Cent. the tenacity of the pure metal diminishes rapidly as the temperature rises and the effect is becoming more serious, owing to the extending use of high pressures.

Comparative tests made at Dillenburg gave the following resultz, viz.:

COPPER.

Degrees C.	15	100	200	300	400
Tensile strength per sq. in.	33,700	29,870	24,890	22,330	13,800
Elongation per cent.	41.6	45.2	44.8	40.1	28.4
Reduction of area per cent.	67	68.5	69	52.7	30

MANGANESE COPPER.

Degrees C.	15	100	200	300	400
Tensile strength per sq. in.	51,060	50,630	50,780	47,650	36,840
Elongation per cent.	40	32.4	36.5	37.1	23.7
Reduction of area per cent.	72.7	60.2	52.4	51.9	....

In England bronzes with 12 per cent. and upward of manganese are used extensively for similar purposes; they are gray in color, and when forged or rolled are very hard. The tensile strength is 56,890 to 73,960 pounds per square inch, and the elongation 28 to 8 per cent. respectively, these properties remaining unchanged at all temperatures up to 350 degrees C. That such material is not more generally used for machine parts which come into contact with high pressure ore superheated steam is probably due to the fact that it could not hitherto be obtained in the form of castings. As will be shown later, this problem has now been solved.

When Weston made known his invention of copper-manganese alloys, the electrical resistance of which decreased as the temperature increased, successful efforts were made in Germany to produce an alloy with a temperature coefficient of nothing. This material, of manganese, nickel, copper alloy, has been manufactured at Dillenburg and sold under the name of manganine for the last fifteen years. It has the specific resistance of about 43 micro ohms, and an extremely small thermo-electric power as compared with copper. It is principally due to the latter property that manganine has become a standard material in the manufacture of electrical resistances and measuring instruments, as other alloys have been discovered with low temperature coefficient but have all high thermo-electric power. Thanks to the process discovered by the German Imperial Testing Institute of artificially ageing the finished coil by heating them to about 140 degrees C., the properties of this metal remain constant indefinitely.

Dr. Heusler next turns to a consideration of the peculiar magnetic properties of a group of manganese alloys discovered by him recently. Metallic manganese, ferro-manganese, and even Hadfield's steel (12 per cent. of manganese) are non-magnetic, and the same is true of the above mentioned bronzes and manganine. Heusler, by chance, discovered that a certain alloy of zinc and manganese showed magnetic properties, as did also the solution of this alloy in an equal weight of copper, the same result being obtained by alloying the commercial manganese copper with zinc. Experimenting along these lines, an addition of aluminum to manganese copper was found to produce an alloy still more strongly magnetic than the first. Experiments with other trial metals show that those of the arsenic group, not excepting the dimagnetic bismuth from magnetic alloys with manganese or manganese copper. The alloys with less than 10 per cent. of manganese and 5 per cent. of aluminum are all practically non-magnetic.

Regarding the practical value of the magnetic bronzes, it is suggested that this loss of magnetism at a comparatively low temperature might be utilized in fire alarm apparatus. Their low electrical conductivity and relatively small hysteresis would seem to favor using them largely for electrical apparatus, but, unfortunately, those alloys which have a relatively high induction of about 4,000 C. G. S. units are so hard and brittle that their use is impracticable. The low manganese alloys can, however, be sufficiently easily worked to allow of their use when low induction is sufficient. Should it prove feasible to make them in the form of bronze powder some important progress could be made in the industries using this class of material.

The investigations described above enabled Heusler to solve the problem mentioned in the early part of his paper—namely, to make a casting bronze, which at temperatures up to 300 degrees C. does not diminish in tensile strength. He noticed that a peculiar effect is produced when aluminum is added to manganese-copper until the percentage is half of that of the manganese. The previously mentioned alloys, containing 76 per cent. copper, 16 per cent. manganese, and 8 per cent. of aluminum, is strikingly close grained, although it can be worked easily.

By successively reducing the manganese and aluminum proportionately, the alloys become gradually softer and more malleable. They may be cast easily and have a solid, homogeneous fracture, very different from that of bronzes, which only contain a small amount of aluminum in conjunction with manganese. The latter can only be cast with difficulty, and are deficient in tensile strength. The manganese aluminum bronzes show the same tensile strength at 300 degrees C. as at ordinary temperatures. A bronze made at Dillenburg for stuffing boxes and similar castings showed:

At 15 degrees, 36,980 lbs. per sq. in. with 9 per cent. elongation.

At 300 degrees, 36,550 lbs. per sq. in. with 14 per cent. elongation.

*From Stahl und Eisen.

The importance of this result is seen when it is taken into consideration that ordinary cast bronze at 300 degrees C. shows only a fraction of its strength at ordinary temperatures and should, therefore, never be used in contact with superheated steam. For all parts subject to high temperatures manganese bronze should be specified. Where rolled material can be used it should be given the preference; where castings are necessary the new manganese aluminum bronze will fill all requirements.

GERMAN SILVER SUBSTITUTE.

The desire is often expressed for a substitute for German silver which shall have a white color. Much has been said about the use of manganese for this purpose, and the statement has ben made repeatedly that certain alloys containing this element compare favorably with the ordinary grades of German silver. It may be well to say in the beginning that manganese suitable for alloying in order to make the German silver substitute is nearly twice as expensive as nickel, so that there is no advantage at all on the score of cheapness.

Manganese resembles nickel in color, though somewhat darker, and similar amounts used in making copper alloys appear to affect the resulting alloy about the same. For example: An alloy containing 60 per cent. of copper, 20 of zinc, and 20 of manganese possesses a grayish white color, but not nearly as pleasing as 20 per cent. German silver. In fact, the color inclines more towards an iron gray. The alloy rolls into sheet as well as German silver.

For sand casting the addition of about one-fourth pound of aluminum to 100 pounds of the above alloy gives a white metal which has a steel gray color and casts well. If more stiffness is desired, the aluminum may be increased. This alloy was put on the market at one time under the name of "Silver Bronze," but even were it cheap the color is hardly pleasing enough to render the alloy valuable. Manganese being readily oxidized, like iron, produces an alloy which is not as non-corrosive as German silver.

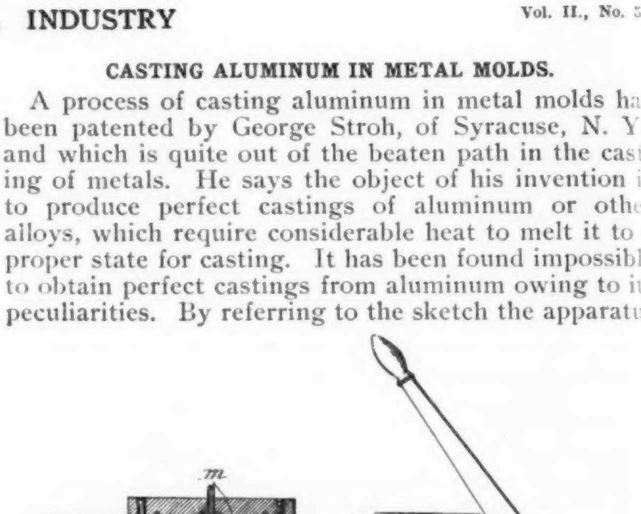
BRONZE MELTING IN A CUPOLA.

The Builders' Iron Foundry, of Providence, R. I., have just completed a job of bronze casting which will interest the majority of brass foundrymen. This company has a brass foundry, but a large bronze casting was required for Government work and the crucible capacity was insufficient. The castings weighed 900 pounds each and the requirements of the Ordnance Department were for 45,000 pounds per square inch in tensile strength and 30,000 pounds elastic limit with 20 per cent. elongation.

The copper for the mixture was melted in an ordinary cupola. It was tapped into a ladle after being melted. In crucibles were melted 450 pounds of scrap from previous heats. The zinc and tin were added to the molten copper in the ladle and the melted scrap from the crucibles then added. The results of the tests were: Tensile strength, 65,000 to 70,000 pounds per square inch; elastic limit, 30,000 pounds; elongation, 20 per cent. Thirteen castings were required, which were made in fifteen heats. It will be seen that the tensile strength not only came up to the requirements, but actually exceeded them.

CASTING ALUMINUM IN METAL MOLDS.

A process of casting aluminum in metal molds has been patented by George Stroh, of Syracuse, N. Y., and which is quite out of the beaten path in the casting of metals. He says the object of his invention is to produce perfect castings of aluminum or other alloys, which require considerable heat to melt it to a proper state for casting. It has been found impossible to obtain perfect castings from aluminum owing to its peculiarities. By referring to the sketch the apparatus



used will be seen. In this drawing *a* represents the melting pot which is provided with a suitable nozzle *b* through which to force the metal into the mold or matrix *m* supported directly over the said nozzle. *c* represents a chute through which to charge the apparatus with the metal to be melted. Said chute is provided with a suitable cut off valve *c* to close the chute during the process of forcing the metal into the mold *m*.

d represents a duct extending from the melting pot *a*. *e* is a cylinder which communicates with the said duct. *f* is a piston disposed in said chamber and operated either by a lever *g*, as shown, or by any other suitable power. A waste cock *h* is connected with the duct *d* for emptying said duct and the melting pot when desired for cleaning same. *i* is the compustion chamber surrounding the melting pot *a* and formed with an extension *i* following along the bottom portion of the duct *d*. *l* denotes one of the oil burners which is used for heating, while *t* denotes the outlet for the gases.

To operate the apparatus I first introduce through the chute *c* a quantity of lead zinc or other metal of a greater specific gravity than the aluminum, the said heavy metal filling the cylinder. The metal fills the greater portion of the duct *d* as represented at A. I then introduce through the chute *c* the aluminum B which is supported on the top of the heavy metal A. I then apply to the combustion chamber the heat necessary to melt the aluminum and at the same time the extension chamber becomes charged with heat from the combustion chamber. In passing down the said extension the heat therein is partially reduced in temperature and the duct *d* absorbing the heat melts the heavy metal A. The waste cock *h* is closed in the meantime. After the aluminum is melted and at the proper heat I close the valve *c* in the chute *c* and set in motion the piston. The heavy metal is set in motion, which forces the aluminum into the mold *m*.

The object of interposing the heavy and easily fusible metal between the aluminum B and the piston f is to avoid the necessity of intensely heating the cylinder *e* and the piston, which intense heat would be required were aluminum allowed to enter this portion of the apparatus.

THE INCREASING USE OF BRONZE DIES.

A steel die is an expensive and treacherous article, and there is no more unsatisfactory problem in the shop than the manufacture of such dies, especially if the pattern is at all complicated in design. As far as we know bronze dies have been used for a long time, but of late there has been a constantly increasing use, and it has been found that they are quite satisfactory in many cases, and are now being used on hard metals as well as soft. The advantage, of course, is in the fact that the die can be cast in a nearly finished condition, and only requires a chasing operation to complete it. The steel die, however, requires to be cut from a solid block, a pretty expensive operation.

The early dies were made of copper and tin alloys, and, while such alloys are hard, they are on the verge of brittleness, if the hardness is sufficient to withstand distortion under the drop hammer. Again in such alloys there is apt to be a liquation of glass-hard products which resist the chasing tool, so that it is almost impossible to cut them. The advent of aluminum alloys brought a good material on the market for this purpose, and it has been found that the aluminum bronzes or aluminum brasses form excellent materials for the purpose. They cast soundly, are perfectly uniform in texture, so that chasing may be satisfactorily performed and may be made hard enough to withstand the pounding, and are, at the same time, free from the brittleness so common in the tin and copper alloys. A 11 per cent. aluminum bronze is a favorite mixture for this work, and, if a brass mixture is desired, the hard manganese bronzes are suitable. We believe that the future will see more bronze dies used than even now. They are certainly giving good results at the present time.

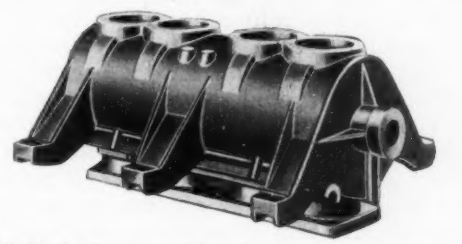
A NEW PROCESS FOR MAKING BRASS INGOT.

A new innovation in the production of brass, bronze, or composition ingot metal ready for use has been brought out by The Ajax Metal Company, of Philadelphia, Pa. The difficulty heretofore in the use of ingot metal in the brass foundry has been that the composition sold on the market not only varied greatly in mixture, but contained all kinds of impurities, antimony, iron, carbon, aluminum, etc., which rendered its use for the manufacture of brass castings an unsatisfactory matter. By a patented process, however, this company is able to produce an ingot of a purity and uniformity in mixture that had never yet been obtained. By this process all impurities are eliminated from scrap metals, and the ingot so produced equal in every respect to new metal. The mixture is likewise very accurately maintained, and with such properties, even the most fastidious foundryman cannot fail to appreciate the fact that he will save money by purchasing his ingot already made. The Ajax Metal Company are able to sell this ingot metal at a less price than the mixture can be made from new metals. The ingot is furnished on any specification and subject to analysis so that there is no risk at all. Claims of this description backed by a company of the integrity and reputation of The Ajax Metal Company, cannot fail to interest every foundryman who makes brass castings.

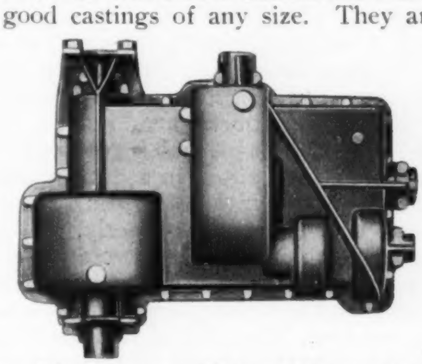
The nickel in the slot name plate machines, by means of which a name may be impressed on a thin sheet of aluminum, are now being used in some establishments for the production of pattern name plates, tags for castings, etc.

ALUMINUM CASTINGS FOR AUTOMOBILES.

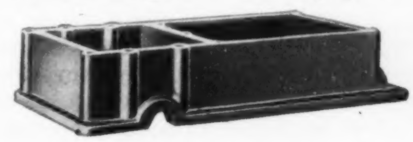
Aluminum is particularly suited for automobiles on account of its lightness, but heretofore great difficulty has been experienced in casting the aluminum alloys. The castings are used very largely for gear cases and quite frequently for engine beds. It is certain that more would be used were it possible to obtain good castings.



The United States Aluminum Company, of Pittsburg, Pa., are making castings of aluminum for this purpose which will enable automobile manufacturers to obtain good castings of any size. They are making



castings for this purpose which weigh nearly 100 pounds and of the strongest alloys. It is believed that it would be well for all automobile manufacturers to thoroughly investigate the question of aluminum castings, as they certainly are advantageous in many places. Several



castings made by the United States Aluminum Company are herewith illustrated and will serve to indicate the difficulty of the work. In connection with the casting of aluminum alloys for automobile work, it may be said that there is probably no class of castings made in sand that require the attention and care that must be put on these alloys. It is for this reason that so few have success with them.

SILOXICON CRUCIBLES.

The invention of siloxicon, the material for fire brick, furnace linings and crucibles which has proven to be so refractory, is already beginning to bear fruit. The Siloxicon Brick Company has recently been incorporated under the laws of Delaware to control the use of siloxicon in the manufacturing field. The company will make brick, crucibles, retorts and linings of this material and will open a New York office in addition to their Niagara Falls plant.

The removal of tin from the surface of scrap tin plate has now become a regular industry and there are already several concerns who do this work. The amount of scrap tin plate produced in the United States is enormous.

THE QUICKENING SOLUTION, OR BLUE DIP.

The preparation of the quickening solution in the silver plating process is a simple matter, yet there appears to be many foolish notions about it. In the first place the true function of the quickening solution is not fully appreciated, and by many it is supposed to act in some mysterious manner. The whole agency of this solution is simply to coat the work with the merest film of mercury before it goes into the cyanide solution for silver plating; beyond this there is no action. The object of this coating of mercury is to render the silver or gold deposit adherent. It prevents the formation of a thin film of oxide, so injurious to the quality of silver plating, and acts as a bond between the base metal and the silver or gold.

All that is required of the quickening solution is to deposit the merest film of mercury over the surface, the smaller the amount the better. A large deposit is injurious, and one often sees solutions in plating rooms which give a deposit of mercury which adheres in drops and the plater does not appreciate the fact that he needs to add water to it. Mercury is so readily reduced from its solutions that there are many solutions containing it which answer for the quickening bath. The battery, of course, need not be used at all, and a simple immersion is all that is required. A quickening bath which does not give a film of mercury all over the surface of a white color in a few seconds is either exhausted or not made properly. Those which give a blackish deposit are to be avoided, as they are positively injurious. If a solution gets into this condition, do not attempt to revive it, but throw it away and make up a new one. The cost of this bath is so small that it does not pay to attempt to doctor it.

There are practically three solutions used for the purpose of making a quickening bath and some prefer one and some another; the ultimate effect, of course, is the same; i. e., the deposition of a thin coat of mercury on the article. The solutions employed are as follows, viz.:

1. Cyanide solution of the oxide of mercury. This is one of the best solutions for the purpose and has the advantage of being a cyanide bath, so that there is no acid left to interfere with the deposition of the silver or gold. An acid solution used for quickening, especially on fancy work, is liable to leave trace of the acid in crevices which prevent the adherence of the silver or gold film.

To make this solution take one-half an ounce of oxide of mercury (red precipitate) and four ounces of cyanide of potash and dissolve in a small amount of water. The red precipitate will not dissolve alone, but will do so if the cyanide is present. If the water is hot, the solution is readily made. When all is dissolved, add the whole to 2 gallons of water. If too strong, more water may be added.

2. Cyanide solution of chloride of mercury. This is made as follows, viz.: Dissolve one-half an ounce of chloride of mercury (corrosive sublimate), one-half pound of sal ammoniac, and one-half pound of cyanide of potash in a small amount of water and add to 2 gallons of water.

3. Nitrate bath. Pernitrate of mercury 1 ounce, sulphuric acid 1 ounce and water 4 gallons. This is an acid solution, and this fact must be carefully borne in mind.

The No. 1 solution is the one recommended, as it is a cyanide solution and does not react with the silver or gold solution if the work is not completely rinsed. It is readily made up and seems to work exceedingly well. It is in use by a large number of concerns.

IMPROVEMENT IN PLATED TABLE FLATWARE.

Silver plated spoons and forks are now produced with a great degree of perfection, and with such a tenacious plate that a good piece of plated ware will almost last a lifetime. There are, however, two places on a spoon or fork which receive a very much larger amount of wear than the remainder. This is on the bottom of the bowl and on the underside of the handle. Both of these places are the ones which receive the most abrasion, and usually wear through long before the rest of the articles show any perceptible wear at all.

As long ago as 1886, William A. Warner appreciated this fact, and conceived the idea of soldering a piece of silver on these parts, which receive this abnormal wear, and from it was evolved the so-called inlaid spoon, sold by the Holmes & Edwards Co. Mr. Warner was allowed

Fig.1.

Fig.2

a patent in 1886, which has now expired. The original method of soldering the piece on involved considerable labor, and he has again taken up the subject and invented a new method of doing this, which he has also patented.

In the present method the blank is treated rather than the formed spoon as hitherto. A recess is cut in the blank at the part desired by means of a milling cutter or otherwise, and the silver melted into it with a suitable flux. The method is indicated in Figs. 1 and 2. The blank is then operated upon in the same manner as ordinary blanks.

The addition of a little boracic acid to a nickel plating solution will give a deposit which will not tarnish as readily when being dried as work plated without it and also appears to give a brighter deposit of nickel. The boracic acid is added to the bath until the solution slightly reddens blue litmus paper. The use of boracic acid is not recommended for all classes of work, but it is now being used in many establishments where small work is plated and upon which no buffing is done. The resulting deposit is quite clean and bright.

A method of producing pure iron electrolytically has been discovered by Prof. C. F. Burgess and Carl Hambouchin, of the University of Wisconsin, Madison, Wis. It is stated that the iron has properties which fit it for electrical work. The iron is made in the same manner as electrolytic copper is made by using an impure anode and depositing it in the chemically pure state on the cathode. This process is interesting from the fact that no pure iron had ever been made up to this time and at no higher degree of purity than 99.82 per cent.

TEMPERING AND COLORING SMALL STEEL ARTICLES.

A blue finish on steel articles is not only beautiful, but acts as a preservative for the steel as well. This coloring is put on by heating the articles to a certain temperature, and heretofore the operation has perplexed many people. When rightly done the process is not a difficult one, but as the articles operated upon are small, they cannot be handled without bringing the cost up very high. They must then be colored in bulk, and to do this properly requires special apparatus, otherwise the coloring will not be uniform. The regulation of the heat simiultaneously regulates the color.

There are many small articles made of steel that are colored in this manner, clock and watch hands, pens, screws, wire goods of all kinds, and similar material. A revolving barrel of some kind, heated from the outside has generally been used, but Edgar Chambers, of Meriden, Conn., has invented an apparatus of this description which embodies many radical departures from the barrel usually employed for the purpose. Mr. Chambers says: "Heretofore in tempering and coloring small articles of steel they have been placed in a barrel supported above some source of heat—a charcoal fire or flame—and the barrel rotated by a hand crank. At the proper time the barrel was lifted from its bearings and the articles thrown out on a tray. This necessitated the constant attention of one man to turn the barrel, and another to empty it. It has not been found possible in such a kind of apparatus to rotate the barrel by power, as when the critical point is reached, the barrel must instantly be removed from the source of heat and still rotated up to the time of removal. Any delay to uncouple mechanism would be disastrous to the work. In my device, however, the barrel is supported above the furnace and mechanically rotated in such a manner that it may be raised from the furnace without unlocking any fastening devices.

The barrel carries mechanism which will engage driving mechanism supported by the furnace, when it is placed above the furnace, and may be withdrawn from such driving means upon the furnace by merely raising the barrel. All parts break engagement when the barrel is removed. One workman is all that is necessary to operate the barrel, and he need not devote his whole time to the operation of the barrel, but may be employed on other work."

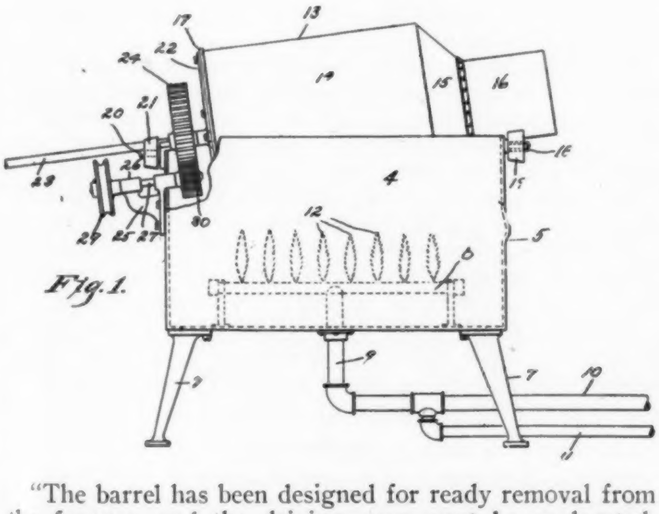


Fig. 1.

"The barrel has been designed for ready removal from the furnace, and the driving gear must be so located, that the barrel may be easily removed by hand. The gearing on the barrel is so distributed that it is not overbalanced."

In Fig. 1 is shown the barrel and the method of heating. The barrel is heated by gas flames 12, as this gives the most uniform and satisfactory heat. Charcoal is not as satisfactory as gas, inasmuch as the heat is unsteady,

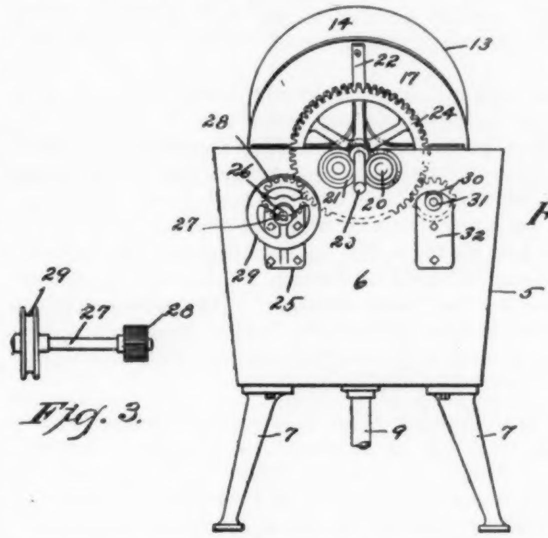


Fig. 2. Fig. 3.

due to the continual burning of the mass, and thus allowing the heat to grow less and less. The burners are encased in sheet iron in order to prevent currents of air from interfering with the proper heat. The shaft 23 serves to rotate the barrel, and also to answer as a handle to remove the barrel. The remainder of the mechanism may be readily seen in Figs. 2 and 3.

WORKING SHEET METALS AFTER PLATING.

Sheet metal articles are usually plated after being spun or stamped, as it has been impossible to plate a sheet of metal which would stand such punishment. The plating would invariably peel off. The American Nickeloid and Manufacturing Company, of Peru, Ill., has succeeded in producing a plated zinc sheet which can be manipulated in this manner. The zinc may be spun, stamped or otherwise treated without the plate peeling off. The nickel plated sheet zinc has been made in Germany for some time and used for making a variety of articles such as toys, reflectors, trays, dog collars, mouth organs, name-plates, buckles, bottle-caps, fancy boxes and metal signs. Zinc was selected for the purpose because it is a cheap metal and will not rust, and the white edge is nearly the same color as the nickel.

For many classes of articles this nickel plated zinc should answer, and forms a cheap and excellent substitute for brass, which requires plating after being finished.

The nickel plated sheet zinc is called "Nickeloid," and the company also makes copper and brass plated sheets. The copper coated sheet is called "Copperoid," and may be had either in the natural color of the polished copper or oxidized and spotted to produce the well-known antique or oxidized finish. The brass plated sheet is called "Brassoid," and may be used to imitate gold by the use of a lacquer colored with dragon's blood.

Stamped sheet zinc is rapidly coming into use for metal ceilings in places where steel has heretofore been used. In Germany the material is even copper plated and given beautiful finishes. Those who have had experience with rusting of steel will readily appreciate the advantage of using zinc.

CORRESPONDENCE DEPARTMENT

In this Department we will answer any question relating to the non-ferrous metals and alloys. Address THE METAL INDUSTRY, 61 Beekman St., New York

Q.—Plater wishes a solution for coloring copper a bluish color. He says that liver of sulphur does not answer.

A.—The most satisfactory solution for coloring copper a bluish black is the ammonia and carbonate of copper bath. This solution is made in the following manner, viz.: Dissolve one pound of carbonate of copper in two gallons of strong ammonia. The work is freed from grease in the potash bath, rinsed, and without drying steeped in the solution heated from 150 to 175 degrees Fahrenheit. The articles are allowed to remain in the solution until the desired color has been obtained. This solution does not work cold and should not be heated above the temperature given, as it will then give off all of its ammonia.

Q.—A brass founder who is making electric crane work wishes to know of a mixture for making certain parts which will have a certain amount of spring to it.

A.—Spring metal is not as readily obtained in casting as it is in sheet or wire as the working of the latter materials give the high resilience. A mixture of 88 parts of copper, 10 of tin, and 2 of zinc has a certain amount of spring in it, but if still more is desired an alloy consisting of copper 63.33, zinc 33.33, and aluminium 3.34 per cent. will give you a strong and resilient metal, but it is quite difficult to cast it on account of its great shrinkage.

Q.—A method of coloring bronze tablets a dark color is desired.

A.—This may be done with liver of sulphur or the usual solution of carbonate of copper in ammonia. For full information about this see answers to other correspondents in this issue or previous ones.

After the bronze has been colored the exposed portions are buffed off with pumice stone or, if a high polish is desired, with rouge.

Q.—A method is desired for preventing the spotting of brass castings after they are copper plated. Our correspondent says that brown spots appear on brass castings after they have been copper plated in portions in which blowholes or other imperfections in the casting appeared.

A.—It is somewhat difficult to prevent this from taking place as the dipping solution or that of the plating bath penetrates the blowholes or spongy spots and does not become removed by the rinsing. We have found that thorough rinsing in hot water removes it to a great extent, but you should obtain better brass castings. The whole trouble lies in the various solutions used entering the cavities and not becoming removed by rinsing. Try the prolonged hot water treatment.

Q.—One of the subscribers states that he has had trouble with copper castings cracking in the mold. This often happens in making sand castings of the so-called pure copper. It is customary to add about 5 per cent. of zinc to copper intended for sand casting, hence our remarks.

A.—The cracking may be avoided by the addition of one-quarter of a pound of manganese copper to the melt. This reduces the oxide of copper, which causes the difficulty, and sound and whole castings will be produced.

Q.—A metal spinner wishes to be able to impart a high finish on aluminum goods after they have been spun. He finds that the spinning operation injures the appearance.

A.—A beautiful satin finish may be produced by dipping the articles in strong potash solution until bubbles are given off freely, then rinsing in water, and next dipping in strong nitric acid. If the finish is not what is desired the operation may be repeated. A scratch brush also gives a good finish and is applied by means of a steel satin finish brush. The sand blast, if you care to install one of these useful appliances, gives good results and is used for this purpose. The trouble with dipping is that all imperfections are brought out very conspicuously and excellent sheet is required.

Q.—Information is desired about the casting qualities of the Popes Island metal, analysis of which was given in our last issue. Our subscriber desires to know whether it will answer for basin cocks and other plumbing accessories of this description.

A.—The difficulty with this, as well as all other alloys containing aluminum, is its not being adapted for making castings to stand pressure. Any alloys containing aluminum if made, for instance, into valves will almost invariably "sweat" when pressure is applied. Of course, the pressure on a faucet or similar article is not as great as that on a steam valve, but unless the casting is a very good one the "sweating" will probably take place. For work not to withstand pressure these alloys are very suitable and have the color desired. It is worth trying for the manufacture of the goods that you wish as you may, by superior casting, be able to overcome, to a large extent, the sweating mentioned. An alloy perfectly satisfactory for the purpose may be substituted for the Popes Island metal. It consists of copper, 60 lbs.; zinc, 25 lbs.; nickel, 15 lbs., and aluminum, ¼ lb.

Q.—Brass founder desires to know what percentage of manganese the alloy manganese copper contains and how it is introduced into the alloy. He wishes to make manganese bronze.

A.—Manganese copper usually contains about 30 per cent. of manganese and the balance copper, and in making manganese bronze it may be introduced along with the copper. Manganese itself cannot be obtained in a state of purity for the purpose of alloying, nor would it be practicable, for manganese is a very high melting metal. The manganese copper found on the market is made from very pure ores and is reduced in the electric furnace in presence of metallic copper which absorbs the manganese as it is reduced. A formula for manganese bronze is copper, 57 per cent.; zinc, 40 per cent.; manganese, 2 per cent., and aluminum, 1 per cent. The proportions may be modified to suit the case. If less hardness is desired reduce the aluminum.

Q.—An acid metal mixture is desired.

A.—Lead, of course, is essential for the making of a good acid metal and one which will do all that is required. A mixture consisting of copper, 80 lbs.; tin, 10 lbs., and lead, 10 lbs., answers admirably.

Q.—A plater wishes to be able to plate goods without cleaning and asks if we can help him out.

A.—Work may be cleaned for the cheapest classes of work by tumbling in clean sawdust; but, unless you do not desire good work, you will have to give it the usual potash bath. There is no greater enemy to the electroplate than grease, and those who do the best work are the ones who pay the most attention to its removal. A benzine dip may also do as well as scouring with pumice, but we should think that the potash bath would be fully as quick and cheap and certainly to be advocated. We do not find any platers are without a potash bath.

Q.—A formula is desired for bronze trolley wheel bushings. The bushing is not part of the wheel, but is made of a separate piece of metal and inserted with graphite in the grooves.

A.—This bushing is the part of the wheel upon which all the wear comes upon and should be made of the best bearing metal. Lead, of course, must be present in the alloy, as no bearing metal is good without it. A good mixture for this purpose is copper, 80 lbs.; tin, 10 lbs., and lead, 10 lbs. This will give you a metal with an excellent wear and one which may be readily machined.

Q.—A receipt for a good, slow acting, bright acid dip is desired.

A.—A good acid dip consists of nitric acid (aquafortis), 1 part; sulphuric acid (oil of vitriol), 2 parts; water, 2 parts. The dip must be used cold unless very rapid action is desired, and as it becomes heated by the action of the acid on the work, the stone crock in which the acid is placed should be surrounded with running water. If the dip acts too violently, add water.

William H. Nichols, president of the General Chemical Company and also of the Nichols Chemical Company, the large copper refiners, has been nominated for president of the Society of Chemical Industry of London. When elected, Mr. Nichols will be the second American to hold the office.

The death of James D. Smith, of the J. D. Smith Foundry Supply Company, of Cleveland, Ohio, is announced. Mr. Smith was born in Cincinnati in 1858 and before he was twenty-one started in the business of producing foundry facings and supplies in the firm of Fitzmorris & Smith. The business, with which he was connected at his death, has become very prosperous and is one of the largest in its line.

The American Steam Gauge & Valve Manufacturing Company, of Boston, Mass., regret to announce the death of their treasurer and general manager, Mr. John L. Weeks. He had been connected with the company for over thirteen years, and his loss is felt by the directors and stockholders, as well as a large circle of business acquaintances. Mr. Ralph B. Phillips has been elected treasurer and general manager in place of Mr. Weeks, and Mr. H. B. Nickerson, secretary and assistant manager, the position formerly held by Mr. Phillips.

The Washburn Wire Company, Phillipsdale, R. I., announce that the officers of their company are now as follows: Eugene F. Phillips, president; Chas. R. Remington, Jr., General Manager, and E. Rowland Phillips, Superintendent. Besides steel wire, the company manufacture bare and insulated electric copper wire.

METAL EXCHANGE ELECTION.

At the annual election of the New York Metal Exchange, the following were elected to serve for the ensuing year: President, Robert M. Thompson, of the Orford Copper Company; vice-president, Adolph Lewisohn, of the United Metals Selling Company; treasurer, Robert L. Crooke. Board of Managers, B. Hochschild, of the American Metal Company, Limited; H. W. Hendricks of Hendricks Brothers; L. Nachmann; G. E. Behr, of Behr & Steiner; Jesse Lewisohn, of the United Metals Selling Company; William Jay Ives; George W. Jacques and J. H. Lang, of the National Lead Company.

OBERMAYER CATALOGUE.

The S. Obermayer Company, whose offices and factories are situated in Cincinnati, Chicago and Pittsburg, have just issued a 370-page bound book which is called "General Catalogue No. 40." The company say it is the most complete and comprehensive catalogue of its kind ever published. There is shown everything needed in a foundry, from large electric cranes down to a hand ladle. The catalogue is carefully indexed, and besides a description of the various foundry supplies, contains a history of the S. Obermayer Company, which was founded in September, 1874, in a very modest way. The company now have four factories and nine branch offices, including three in foreign lands. "General Catalogue No. 40" is a handy reference book for every foundryman.

The Marlin Fire Arms Company, of New Haven, Conn., are about to begin the manufacture of ammunition and have purchased the entire business and machinery of The American Cartridge and Ammunition Company, of Hartford, Conn. The American Cartridge and Ammunition Company went into business in 1901. The factory was equipped with patented machinery which the Marlin Company have now acquired.

The American Tap & Die Company, Greenfield, Mass., have issued their first catalogue which illustrates and describes their taps and dies, and gives list prices. The company announce that though their factory is small it is equipped with the latest machinery, and that their business is growing beyond their expectations.

The Federal Brass and Bronze Company, New York city, have been incorporated, with a capital of $10,000, to manufacture brass and bronze work of special designs, including doors, grilles, gates, railings and tablets. The officers are W. E. Irving, president; Wm. K. Waterman, treasurer, and Ed. H. Antonius, secretary.

The Hoerle Manufacturing Company, of Pittsburg, Pa., have been organized with a capital of $100,000 to manufacture a number of specialties. They will also do plating, model and pattern work and have established a factory in the Eagle Power Building, Allegheny, Pa.

Brink & Washer, who have recently taken over the plant of J. R. Rand & Co., Brattleboro, Vt., will make high grade machinery, electrical instruments, etc. The company would like some first class specialty to manufacture on contract, and will also build models and develop inventions.

The Tabor Manufacturing Company, of Philadelphia, Pa., manufacturers of molding machines, have opened a Boston office at No. 70 Kilby street. The office will be in charge of C. S. Lovell.

The new buildings of The Elm City Brass and Rivet Company, of Plainville, Conn., are nearly completed. The building formerly occupied by Clark & Cowles is to be part of the new factory.

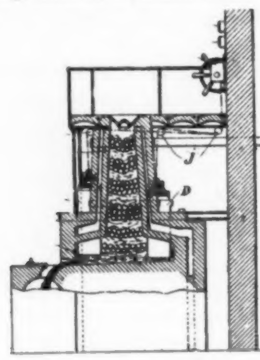
The Youngstown Bronze Company, of Youngstown, Ohio, report that they are figuring with several parties for a building, and may buy one and have it moved to their plant.

The Crowe Metal Manufacturing Company, of 71 West Jackson Boulevard, Chicago, Ill., have begun the manufacture of name plates and metal cards by a patented process.

PATENTS

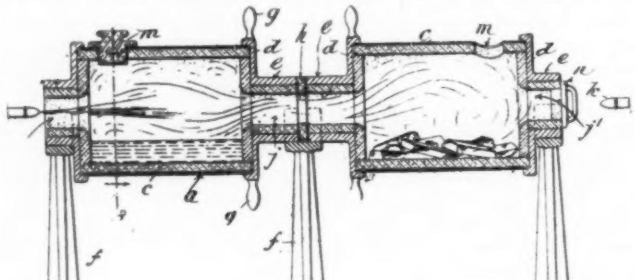
A full copy of any Patent mentioned will be furnished for Ten Cents. Address THE METAL INDUSTRY, 61 Beekman Street, New York

754,656, March 15, 1904. ELECTRIC FURNACE.—Charles A. Keller, Paris, France. In a double electric and continuously-operating metallurgic furnace in which the upper furnace, formed as a stack-furnace, is designed for the reduction of metal and in which the lower furnace of the ordinary kind, pierced at its upper part by a conduit located below and in the prolongation of the charging-column of the upper furnace is designed for refining, purifying or alloying metals, a chamber of fusion of the upper



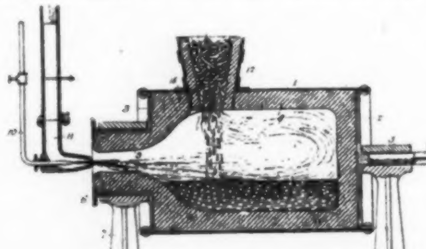
furnace with a charging-column located at the central part of its roof, openings pierced around the charging-column in the roof of the chamber of fusion of the upper furnace, and vertical electrodes in two parallel series, passed through the openings in the roof of the chamber of fusion, the lower extremities of these electrodes being situated in the interior of the chamber of fusion and their upper extremities, exterior to the said chamber of fusion, being carried each by a suspension mechanism by the aid of which they are capable of being vertically displaced and removed.

750,748. Jan. 26, 1904. MELTING FURNACE. John F. Barker, Springfield, Mass., assignor to the Gilbert & Barker Manufacturing Company, Springfield, Mass., a corporation.—The combination of two cylindrical furnaces, independently revoluble on a common axis, there being an axially-located opening in each



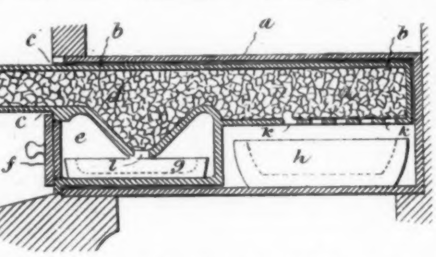
end of each furnace, the openings in the contiguous ends of said furnaces constituting a passage from one to the other; a gate in said passage; there being a charging and pouring opening in each furnace near the outer end thereof, together with means to introduce gaseous or liquid fuel into either furnace.

753,122, Feb. 23, 1904. MELTING-FURNACE.—Henri J. J. Charlier, Philadelphia, Pa. The combination of the body of a furnace pivotally mounted so as to turn about its longitudinal axis



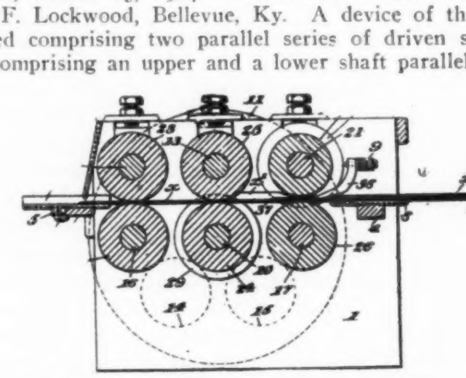
and having at one end an axial opening for receiving gaseous products of combustion, with a combined vent and pouring opening located in the periphereal portion of the body of the furnace closer to that end of the same which receives the products of combustion than to the other end, substantially as specified.

754,141, March 8, 1904. PROCESS OF OBTAINING ZINC.—Evan H. Hopkins, South Kensington, London, England. The process of obtaining zinc from substances containing it in a metallic



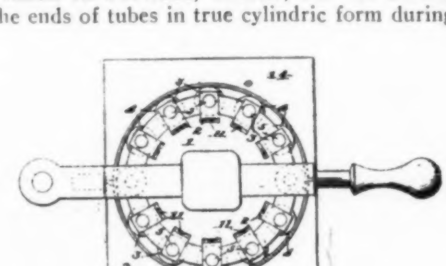
state which consists of subjecting the substances to heat, excluding air and the heating-flame therefrom, and in conveying the zinc-vapors into and condensing all of them in a mass of heated carbon from which air is excluded, substantially as described.

754,786, March 15, 1904. SHEET-METAL-EDGING MACHINE.—Edwin F. Lockwood, Bellevue, Ky. A device of the character described comprising two parallel series of driven shafts, each series comprising an upper and a lower shaft parallel with each



other, two sets of corresponding edging-rolls held on each series of shafts, each set of rolls being adapted to bend an edge portion of a metal sheet passed between them and dies or formers extended between the respective rolls of each set on one series of shafts and around which the metal sheet is adapted to be bent.

755,198, March 22, 1904. IMPLEMENT FOR TRUING THE ENDS OF TUBING.—Edward D. Webb, Chester, Pa., assignor of one-half to Francis A. Forwood, Chester, Pa. In an implement for holding the ends of tubes in true cylindric form during the opera-



tion of cutting screw-threads thereon, a body having a plurality of radial equidistant slots means for holding said body against rotation within the tube, a bearing fitted radially adjustably in each slot and separate and independent means for adjusting radially each bearing in each slot rollers having cylindric faces fitted in each of said bearings and arranged to stretch and hold the tube in true circular form as described and shown.

TRADE NEWS

When You Have Any Trade News of Interest Send It to THE METAL INDUSTRY, 61 Beekman Street, New York.

The United Metals Selling Company have moved their offices from 11 to 42 Broadway, New York.

The new rolling mill of the Phosphor Bronze Smelting Company, Philadelphia, Pa., is in operation.

The Whitlock Coil Pipe Company, Hartford, Conn., have recently added a large department for working brass, sheet and castings.

"Stop the Leaks in Your Crucibles" is the title of a pamphlet issued by the McCullough-Dalzell Crucible Company, of Pittsburg, Pa.

"Jack Frost" is the title of a folder issued by the Haines, Jones & Cadbury Company, of Philadelphia, Pa., manufacturers of plumbers' supplies.

The Taplin Manufacturing Company, of New Britain, Conn., are making their safety match stands and trays in a variety of metals, including brass and bronze.

The United Metile Company, of Waltham, Mass., has a secret process for enameling sheet zinc. The enameled sheet looks like tiles and is sold at a lower cost.

We have received from Robert A. Reid, 411 Olive street, St. Louis, a birdseye view of the St. Louis World's Fair. Mr. Reid publishes pictures and pamphlets about the Exposition.

The Unique Metal Company, of Buffalo, N. Y., are making what they call flexible aluminum. It is cast aluminum which can be hammered into various shapes.

J. Register's Sons Company, of Baltimore, Md., report that they are no longer jobbers, but manufacturers only, of plumbers' and steam fitters' brass work of all descriptions.

Royle & Akin, wire manufacturers of Newark, N. J., have arranged to locate their factory at Ossining, N. Y. They make wire in copper, brass, bronze, steel, aluminum and alloys.

The H. H. Shimer Co., proprietors of a smelting works at Philadelphia, Pa., are making a specialty of brazing solder, believing that they make as good a quality as can be found.

At the Sportsmen's Show recently held in New York City, The Victor Metals Company, of East Braintree, Mass., had an interesting exhibit of their Victor bronze in the shape of marine castings.

The Hudson Rolling Mill Company, of Bloomfield, N. J., make a specialty of smooth finished sheet copper, in sheets, rolls, circles, small blanks, etc., annealed or hard rolled to any required temper.

The T. F. Tuttle Silver Company, of Boston, Mass., have bought a large factory in Malden, Mass., into which they will soon move and will maintain a branch Boston office at 21 Bromfield street.

The Egyptian Lacquer Manufacturing Company, 152 Front street, New York, make cold air drying lacquers for brass, aluminum, gold and silver and a dip and brush lacquer for gun metal finish.

The Hoyt Metal Company, St. Louis, Mo., report that they have been delayed somewhat in completing their new buildings at Granite City, Ill., and do not expect to move into them until about June 1.

Harry A. Spear has taken charge of the brass foundry at 130 Oliver street, Boston, Mass., formerly occupied by the Hodgdon Brass Works. He will make brass, bronze, aluminum and composition castings.

The Queen City Brass & Iron Works, Cincinnati, Ohio, manufacturers of a complete line of brass goods, have issued a catalogue which they will be glad to send to the trade interested in their line of goods.

The Lanyon Zinc Company, of St. Louis, Mo., are making a specialty of sheet zinc for electrical purposes. They manufacture rods and sheet cut and pressed into irregular shapes. Also sheet zinc for roofing.

The P. A. Coon Silver Manufacturing Company, have bought the plant formerly occupied by the A. G. Finn Silver Company, 512 East Water street, Syracuse, N. Y. They manufacture silver plate, hollow ware and flat ware.

The Westinghouse Machine Company, Pittsburg, Pa., have received a large number of orders for gas engines, including one for a 1,000 horse-power engine, from the Winchester Repeating Arms Company, Winchester, Mass.

The E. J. Manville Machine Company, Waterbury, Conn., report that their new factory will be finished and ready for occupancy by September 1. The building is near the station of the Waterbury and New Haven Railroad.

Blake & Johnson, builders of machinery at Waterbury, Conn., issue an elaborate catalogue showing all of their various machines, many of which are suitable for working the non-ferrous metals. The firm was established in 1852.

"Alphab Bronze," manufactured by G. L. Cabot, Boston, Mass., is cast in ingots showing a tensile strength of 60,000 pounds with 26 per cent elongation. The bronze can be worked hot or cold and the tensile strength greatly increased.

The Adams Company, of Dubuque, Iowa, have reincorporated and increased their capital stock from $50,000 to $100,000. They are large manufacturers of molding machines, tumbling barrels, snap flasks, milling machines, cutter grinders, etc.

Brooks Brothers Brass Foundry, of Buffalo, N. Y., report that they are busy casting some important work. With their present facilities they hope to secure much of the Buffalo work in heavy castings which has formerly gone to other cities.

The St. Paul Roofing Cornice and Ornament Company, St. Paul, Minn., will erect a factory in Baltimore, Md., for the manufacture of sheet metal architectural specialties, giving special attention to the production of sheet metal windows, sashes and doors.

At the annual meeting of the stockholders of the Joseph Dixon Crucible Company, held in Jersey City, April 18, the following officers were re-elected: President, E. F. C. Young; vice-president and treasurer, John A. Walker; secretary, Geo. E. Long.

A neat and attractive catalogue on "Oil Furnaces" is issued by the Monarch Engineering & Manufacturing Company, Baltimore, Md., builders of the Steele-Harvey melting and refining furnace. With this furnace oil is used for fuel, but the metal is melted in crucibles.

We recently received an inquiry for the names of manufacturers of zinc shingles. Two firms which make a specialty of metal shingles and tiles of zinc and other metals, are, Gerock Bros. Manufacturing Company, St. Louis, Mo., and Merchant & Co., Philadelphia.

The Bridgeport Crucible Company, of Bridgeport, Conn., report that their business is steadily increasing and they will enlarge their plant by the erection of a two-story building 35 x 128 feet. They have planned for further additions and improvements for this fall and next spring.

The Cutter, Wood & Stevens Company, of Boston, Mass., are manufacturers and dealers of everything needed by the founder, finisher and plater, having a complete stock of foundry supplies, all kinds of finishing machinery and tools and complete electroplating and polishing outfits.

The Metal Goods Company have recently been organized at Belmont, N. Y., for the manufacture of white metal and brass pattern letters and figures. They will also make some specialties such as name plates for doors, church pews, machinery, etc. The company send out their catalogue for the asking.

The E. W. Bliss Company, of Brooklyn, N. Y., have just issued a very attractive catalogue of their power presses and other machinery. The catalogue is finely illustrated and printed and contains a plan of the St. Louis World's Fair, showing the location of the Bliss exhibit in the palace of machinery.

The Hamilton Metal Pattern Company, of Hamilton, Ohio, have changed their name to the National Caster Company, and will give their attention to the manufacture of the Martin anti-friction, two-wheeled caster. C. J. Parrish is president; W. S. Brown, secretary, and John Kaefer, general manager.

Wishing to be under the jurisdiction of the State of Connecticut, the Randolph-Clowes Company, of Waterbury, Conn., have incorporated under the Connecticut laws, with a capital of $500,000. The incorporators are Morris B. Beardsley, William B. Boardman and Arthur M. Marsh, all of Bridgeport, Conn.

Handy & Harman, manufacturers of rolled sterling silver and silver annodes, whose factory is at Bridgeport, Conn., have moved their New York office from 32 Nassau street to 22 Pine street, where they will have more room and better light. Their new office is on the street floor and is situated right opposite the United States Sub-Treasury.

The Providence Brass Manufacturing Company have been incorporated with $25,000 capital. The incorporators are: Fred. H. Manchester, Irving E. Brown, Bernard Gardiner. Besides gas burners which the company have made for a number of years they will manufacture brass goods. Their factory is at 25 Blount street, Providence, R. I.

The Atlantic Stamping Works, of Rochester, N. Y., have been incorporated with a capital stock of $50,000 to manufacture metal goods. The officers are: Griff D. Palmer, president; Thomas G. Skuse, vice-president, and Wm. J. McKelvey, secretary and treasurer. The company are already manufacturing goods, and expect to be in good shape by April 1.

A soldering fluid and salt manufactured by Emil Schneider, 298 South street, Newark, N. J., are specially suitable for brass work. The soldering fluid is always ready, and by the use of it a good smooth soldered joint can be made free from pin holes. The Schneider brazing powder has been in use for years and is a standard flux in shops that do brazing.

Judge Hale, in United States Circuit Court of Massachusetts, has handed down a decision in favor of the United Wire & Supply Company, Providence, R. I., against the H. M. Williams Company, of Attleboro, Mass., in a suit brought for infringing patents on seamless plated wire. Since the decision the wire company have asked the court for injunctions restraining other firms.

The notable bronze doors were recently made by the T. F. McGann & Sons Company, brass founders of Boston, Mass. The doors were 8x5 feet, weighed 1,500 pounds and were cast in sections and bolted together. They were for the Portsmouth Savings Bank, Portsmouth, N. H., and some handsome bronze grill work and tablets were also cast by the company to go with the doors.

The site of the plant of the Clowes Brass & Copper Corporation is to be called Brass City. It is located near Ellwood City, which is about thirty miles north of Pittsburg, Pa. The corporation have bought the Toledo, Ohio, and Albany, Ind., plants of the Shelby Steel Tube Company, and will move them to Brass City. It is expected that the new works will be in operation by January 1. They will manufacture brass and copper tubing, sheet, rod and wire.

The largest stock of metals in New England is kept by Richards & Co., in their six-story building at 60 Union street and running through to Friend street, Boston, Mass. The firm makes a specialty of prompt shipment to brass founders and sells at the lowest market prices. The upper stories of their building are stored with galvanized iron and tin plates; the lower stories are stocked with ingot metals, including every metal used by the brass founder.

The Star Refining Company, of Boston, Mass., have leased a building at the corner of A and First streets, South Boston, formerly occupied by Sweat & Chase. The company will move their smelting works from Cambridge to South Boston, and in addition to smelting metals will also make brass castings. Edward P. Barrett, who is president and manager, will have charge of the smelting works, and M. W. Chase will be superintendent of the brass foundry.

The Watson-Stillman Company, of New York, builders of hydraulic machinery have moved their office, to 46 Dey street, New York city, and their shop to Aldene, Union county, N. J., where they have new works. The shops are located at the junction of the Lehigh Valley, Baltimore and Ohio railroads and have a connection with the Central Railroad of New Jersey. The company will now have ample room to expand and conveniently handle such work as they may receive.

Owing to a great increase of trade the Perkins Machine Company, South Boston, Mass., have bought five acres of land in Warren, Mass., on which is a machine shop 300x80 feet, a foundry 110x60 feet and a pattern shop 100x40; also blacksmith shop and other small buildings. There are two electric cranes and the company intend to run their plant by electric motors. The Perkins Company manufacture all kinds of presses and expect to have their new plant in operation by May 1.

The Cowles Electric Smelting & Aluminum Company, of Lockport, N. Y., manufacture a manganese copper containing as high as 35 per cent. of manganese. As their manganese copper is made in an electric furnace from pure copper and manganese oxide, it is claimed to be the only manganese copper not containing iron, other brands being made from ferro-manganese. The Ajax Metal Company, of Philadelphia, are selling agents for the manganese copper made by the Cowles Company.

The Waterbury Brass Company, of Waterbury, Conn., have decided to discontinue their New York store at 122 Centre street, and will in the future maintain an office at 99 John street. The company have put up a new building at Waterbury, Conn., which will give them much larger stock room than they formerly had in New York, and all orders will be filled as promptly and as satisfactorily from their Waterbury stock room as they were from New York. The stock which the Waterbury Company carried in their New York store has been sold to the U. T. Hungerford Brass & Copper Company, of 505 Pearl street, New York.

Metal Prices, May 3, 1904

METALS

	Price per lb.
Tin—Duty Free.	
Straits of Malaca	28.10
Copper, Pig, Bar and Ingot and Old Copper—Duty Free. Manufactured 2½c. per lb.	
Lake	13.50
Electrolytic	13.25
Casting	13.00
Spelter—Duty 1c. per lb.	
Western	5.25
Lead—Duty Pigs, Bars and Old 2⅛c. per lb.; pipe and sheets 2½c. per lb.	
Pig Lead	4.65
Aluminum—Duty Crude, 8c. per lb. Plates, sheets, bars and rods 13c. per lb.	
Small lots	37.00
100 lb. lots	35.00
1,000 lb. lots	34.00
Ton lots	33.00
Antimony—Duty ¾c. per lb.	
Cooksons	8.00
Halletts	7.25
Other	6.25
Nickel—Duty 6c. per lb.	
Large lots	40 to 50
Small lots	50 to 75
Bismuth—Duty Free	$1.50 to $2.00
Phosphorus—Duty 18c. per lb.	
Large lots	45
Small lots	65 to 75
	Price per oz.
Silver—Duty Free—Commercial Bars	$0.57
Platinum—Duty Free	19.00
Gold—Duty Free	20.00
Quicksilver—Duty 7c. per lb. Price per Flask	47.50

Zinc—Duty, Sheet, 2c. per lb.; 600-lb. casks, 6.75c. per lb., open, 7.25c. per lb.

Tobin Bronze—Rods, Unfinished, 19c.

Tobin Bronze—Rods, Finished, 20c.

PRICE FOR ALUMINUM BRONZE INGOTS.

	Per pound.
2½ per cent	19c.
5 per cent	19½c.
7½ per cent	20½c.
10 per cent	21½c.

Manganese Bronze, Ingots	16½c.
Phosphor Bronze, Ingots	15 to 18c.
Silicon-Copper, Ingots	34 to 36c.

OLD METALS

	Buying.	Selling.
Heavy Cut Copper	11.50c.	12.50c.
Copper Wire	10.75c.	11.25c.
Light Copper	10.25c.	10.75c.
Heavy Mach. Comp	10.00c.	10.75c.
Heavy Brass	7.75c.	8.50c.
Light Brass	6.00c.	6.75c.
No. 1 Yellow Brass Turnings	7.50c.	8.25c.
No. 1 Comp. Turnings	8.50c.	9.50c.
Heavy Lead	4.15c.	4.40c.
Zinc scrap	3.75c.	4.00c.
Scrap Aluminum, sheet, pure	22.00c.	25.00c.
Scrap Aluminum, cast, alloyed	16.00c.	20.00c.
Old Nickel	15.00c.	25.00c.

PRICES OF SHEET COPPER

Sizes of Sheets.		96oz. & over 75 lb. sheet 30x60 and heavier	64oz. to 96oz. 50 to 75 lb. sheet 30x60	32oz. to 64oz. 25 to 50 lb. sheet 30x60	24oz. to 32oz. 18¾ to 25 lb. sheet 30x60	16oz. to 24oz. 12½ to 18¾ lb. sheet 30x60	14oz. and 15oz. 11 to 12½ lb sheet 30x60
		Cents per pound.					
Not wider than 30 ins.	Not longer than 72 ins.	18	19	19	19	19	20
	Longer than 72 ins. Not longer than 96 ins.	18	19	19	19	19	20
	Longer than 96 ins.	18	19	19	19	19	21
Wider than 30 ins. but not wider than 36 ins.	Not longer than 72 ins.	18	19	19	19	19	21
	Longer than 72 ins. Not longer than 96 ins.	18	19	19	19	19	21
	Longer than 96 ins. Not longer than 120 ins.	18	19	19	19	20	22
	Longer than 120 ins	18	19	19	20	21	
Wider than 36 ins. but not wider than 48 ins.	Not longer than 72 ins.	18	19	19	20	21	23
	Longer than 72 ins. Not longer than 96 ins.	18	19	19	20	22	24
	Longer than 96 ins. Not longer than 120 ins.	18	19	19	21	23	27
	Longer than 120 ins.	18	19	20	22	25	
Wider than 48 ins. but not wider than 60 ins.	Not longer than 72 ins.	18	19	19	20	22	25
	Longer than 72 ins. Not longer than 96 ins.	18	19	19	21	23	28
	Longer than 96 ins. Not longer than 120 ins.	18	19	20	22	25	
	Longer than 120 ins	19	20	21	23	27	
Wider than 60 ins. but not wider than 72 ins.	Not longer than 96 ins.	18	19	20	22	27	
	Longer than 96 ins. Not longer than 120 ins.	18	19	21	24	29	
	Longer than 120 ins.	19	20	22	27		
Wider than 72 ins. but not wider than 108 ins.	Not longer than 96 ins.	19	20	22	25		
	Longer than 96 ins. Not longer than 120 ins.	20	21	23	26		
	Longer than 120 ins.	21	22	24	28		
Wider than 108 ins.	Not longer than 132 ins.	22	23	25			
	Longer than 132 ins.	23	24	27			

Rolled Round Copper, ⅜ inch diameter or over, 21 cents per pound. (Cold Drawn, Square and Special Shapes, extra.)

Circles, Segments and Pattern Sheets three (3) cents per pound advance over prices of Sheet Copper required to cut them from.

All Cold or Hard Rolled Copper, 14 ounces per square foot and heavier, one (1) cent per pound over the foregoing prices.

All Cold or Hard Rolled Copper, lighter than 14 ounces per square foot, two (2) cents per pound over the foregoing prices.

Cold Rolled and Annealed Copper, Sheets and Circles, wider than 17 inches, take the same price as Cold or Hard Rolled Copper of corresponding dimensions and thickness.

All Polished Copper, 20 inches wide and under, one (1) cent per pound advance over the price for Cold Rolled Copper.

All Polished Copper, over 20 inches wide, two (2) cents per pound advance over the price for Cold Rolled Copper.

Planished Copper, one (1) cent per pound more than Polished Copper.

Cold Rolled Copper prepared suitable for polishing, same prices and extras as Polished Copper.

Tinning Sheets, on one side, 2½c. per square foot.

For tinning both sides, double the above price.

For tinning the edge of sheets, one or both sides, price shall be the same as for tinning all of one side of the specified sheet.

Metal Prices, May 3, 1904

COPPER BOTTOMS, PITS AND FLATS

Net Cash Prices.

14 oz. to square foot, and heavier, per lb. .... 23c.
Lighter than 10 oz. .... 24c.
10 oz. and up to 12 oz. .... 26c.
12 oz. and up to 14 oz. to square foot, per lb. .... 29c.
Circles less than 8 in diam., 2c. per lb. additional.
Circles over 13 in. diam., are not classed as Copper Bottoms.
Polished Copper Bottoms and Flats, 1c. per lb. extra.

PRICE LIST FOR ROLL AND SHEET BRASS

Prices are for 100 lbs. or more of sheet metal in one order.
Brown & Sharpe's Gauge the Standard.

Common High Brass	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
Wider than and including	2 12	12 14	14 16	16 18	18 20	20 22	22 24	24 26	26 28	28 30
To No. 20 inclusive..	.22	.23	.25	.27	.29	.31	.33	.36	.39	.42
Nos. 21, 22, 23 and 24	.22	.24	.26	.28	.30	.32	.34	.37	.40	.43
Nos. 25 and 26........	.23	.24½	.27	.29	.31	.33	.35	.38	.41	.44
Nos. 27 and 28........	.23	.25	.28	.30	.32	.34	.36	.39	.42	.45

Add ½ cent per lb. additional for each number thinner than Nos. 28 to 38, inclusive.

Add 7 cents per lb. for sheets cut to particular lengths, not sawed, of proportionate width.

Add for polishing on one side, 40 cents per square foot; on both sides, double this price.

Brazing, Spinning and Spring Brass, 1 cent more than Common High Brass.

Extra Quality Brazing, Spinning and Spring Brass, 2 cents more than Common High Brass.

Low Brass, 4 cents per lb. more than Common High Brass.

Gilding, Rich Gold Medal and Bronze, 7 cents per lb. more than Common High Brass.

Discount from List, 30 per cent.

PRICE LIST FOR BRASS AND COPPER WIRE

BROWN & SHARPE'S GAUGE THE STANDARD.	Com. High Brass	Low Brass	Gilding Bronze and Copper
All Nos. to No. 10, Inc.	$0.23	$0.27	$0.31
Above No. 10 to No. 16..	.23½	.27½	.31½
Nos. 17 and 18..........	.24	.28	.32
" 19 and 20..........	.25	.29	.33
No. 21..........	.26	.30	.34
" 22..........	.27	.31	.35
" 23..........	.28	.32	.36
" 24..........	.30	.34	.38

Discount, Brass Wire, 30 per cent.; Copper Wire, 40 per cent.

PRICES FOR SEAMLESS BRASS TUBING

From 2 in. to 3¼ in. O. D. Nos. 4 to 12 Stubs Gauge, 18c. per lb. Seamless Copper Tubing, 22c. per lb.
For other sizes see Manufacturer's List.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron Pipe size.....	⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	4½	5	6
Price per lb........	23	20	20	19	18	18	18	18	18	18	18	20	20	22	24	25

BRAZED BRASS TUBING

Brown & Sharpe's Gauge the Standard.

											Per lb
Plain	Round	Tube,	¾	in.	up	to	2	in.,	to No.	19, inc.	$0 35
"	"	"	⅝	"	"		¾	"	"	19, "	36
"	"	"	½	"	"		⅝	"	"	19, "	38
"	"	"	⅜	"	"		½	"	"	19, "	41
"	"	"	5/16	"	"		⅜	"	"	19, "	48
"	"	"	¼	"	"		5/16	"	"	19, "	65
"	"	"	3/16	"	"		¼	"	"	19, "	1 06
"	"	"	⅛	"	"		3/16	"	"	19, "	1 50

Smaller than ⅛ inch .... Special
2 inch to 3 inch, to No. 19, inclusive 38
3 inch 40
Over 3 inch to 3½ inch 45
Over 3½ inch 50

Bronze and copper advance 3 cents. Discount 30 per cent.

PRICE LIST FOR SHEET ALUMINUM

PLATE AND SHEET PRICE LIST.—B. & S. GAUGE.

Prices are for 50 pounds or more at a time. Less quantities, 5 cents per pound additional. Charges made for boxing.

Wider Than... And Including...	*3 in. 12 in. in coils.	6 in. 14 in.	14 in. 16 in.	16 in. 18 in.	18 in. 20 in.	20 in. 24 in.	24 in. 30 in.	30 in. 36 in.	36 in. 40 in.	40 in. 45 in.	45 in. 50 in.	50 in. 55 in.	55 in. 60 in.	Polishing One Side.	Sat. Fin. without Lacquer. One Side.
No. 13 & heavier..	......	42	44	44	44	44	47	47	47	48	48	49	50	2	6
" 14..........	......	42	44	44	44	44	47	47	47	48	48	49	50	2	6
" 15..........	......	42	44	44	44	44	47	47	47	48	48	49	50	2	7
" 16..........	......	42	44	44	44	44	47	47	47	48	48	49	50	2	8
" 17..........	......	42	44	44	44	44	47	47	47	48	48	49	50	3	9
" 18..........	......	42	41	44	44	44	47	47	50	51	51	54	57	3	10
" 19..........	......	42	44	44	44	44	47	48	51	52	52	56	59	4	11
" 20..........	42	44	44	44	41	46	49	50	52	53	53	58	61	4	12
" 21..........	42	46	46	46	46	48	51	52	58	59	62	65	......	5	14
" 22..........	42	46	46	46	48	48	51	55	59	61	64	......	......	5	16
" 23..........	42	46	46	46	48	48	51	57	60	64	......	......	......	6	18
" 24..........	42	46	48	50	50	50	53	59	62	......	......	......	......	6	20
" 25..........	44	47	49	51	51	51	54	61	......	......	......	......	......	7	23
" 26..........	44	47	50	54	54	54	59	......	......	......	......	......	......	8	25
" 27..........	44	48	52	56	56	57	62	......	......	......	......	......	......	10	28
" 28..........	44	48	54	56	57	57	64	......	......	......	......	......	......	11	32
" 29..........	46	49	56	58	60	60	69	......	......	......	......	......	......	13	36
" 30..........	46	50	58	60	64	70	77	......	......	......	......	......	......	15	40
" 31..........	48	52	60	63	68	76	......	......	......	......	......	......	......	17	44
" 32..........	50	54	62	66	74	82	......	......	......	......	......	......	......	19	50
" 33..........	52	56	......	......	......	......	......	......	......	......	......	......	......	21	57
" 34..........	55	60	......	......	......	......	......	......	......	......	......	......	......	25	66
" 35 & 36......	1 67	Not wider than 6 in.	......	......	......	......	......	......	......	......	......	......	......	Polished two sides double above prices.	Satin Finish two sides double above prices.
" 37 & 38......	1 98		......	......	......	......	......	......	......	......	......	......	......		
" 39 & 40......	2 22		......	......	......	......	......	......	......	......	......	......	......		
" .008" to .0015"..	2 42		......	......	......	......	......	......	......	......	......	......	......		
Less than .0015"..	2 66		......	......	......	......	......	......	......	......	......	......	......		

Additional charge for slitting coiled sheet in widths less than 3 in. and flat rolled sheets in widths less than 6 in.
All columns except the first are for Flat Rolled Sheets.

Discounts as follows are given for sheet orders over 200 pounds.

200 to 1,000 pounds .... 10 per cent. off list.
1,000 to 2,000 " 10 per cent. and 2 " "
2,000 to 4,000 " 10 " " 3 " "
4,000 pounds and over 10 " " 5 " "

Sheets polished or satin-finished on both sides, double the price for one side.

Price Per Foot of Seamless Aluminum Tubing.

(CHARGES MADE FOR BOXING.)

THICKNESS OF WALL IN STUBS' GAUGE.

Outside Diameter in Inches.	No. 12.	No. 14.	No. 16.	No. 18.	No. 20.	No. 22.	No. 24.		Outside Diameter in Inches.
1-4..........	......	......	......	10	9	8	7		1-4
5-16..........	......	......	......	11	9	8	7		5-16
3-8..........	......	......	......	12	9	8	7		3-8
1-2..........	......	......	17	14	11	9	8		1-2
5-8..........	......	......	21	16	13	12	......		5-8
3-4..........	......	......	25	19	16	14	......		3-4
7-8..........	......	......	28	22	18	16	......		7-8
1..........	......	......	30	25	21	19	......		..........1 00
1 1-4..........	......	......	36	30	25	......	......		..........1 14
1 1-2..........	......	52	43	35	28	......	......		..........1 12
1 3-4..........	......	60	50	41	33	......	......		..........1 34
2..........	84	68	58	47	37	......	......		..........2 00

Discount 20 to 30 per cent.

ALUMINUM

Drawn Rod and Wire Price List.—B. & S. Gauge.

Diameter B. & S. G'ge.	0000 to No. 10	No. 11.	No. 12.	No. 13.	No. 14.	No. 15.	No. 16.	No. 17.	No. 18.	No. 19.	No. 20.	No. 21.	No. 22.
Price per lb	$ 38	38½	38½	0 39	39½	0 40	40½	0 41	0 42	0 43	0 44	0 47	0 52

200 lbs. to 30,000 lbs., three cents off list.
30,000 lbs. and over, four cents off list.

All columns except the first are for Flat Rolled Sheets.